We Claim

1. A method for obtaining a soft decision in detection of a TFM signal, comprising:

sampling a received signal,

reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample and computing path metrics for each survivor path,

selecting the path with larger metrics as a survivor from paths entering a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

selecting the survivor with the largest metric as the best survivor,

determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

2. A method for obtaining a soft decision in detection of a TFM signal, comprising:

sampling a received signal,

reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

rotating a carrier phase,

computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample and computing path metrics for each survivor path,

selecting the path with larger metrics as a survivor from paths entering to a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

selecting the survivor with the largest metric as the best survivor,

determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

3. A method for obtaining a soft decision in detection of a TFM signal, comprising:

sampling a received signal,

reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample using two earlier symbols as an original state of the trellis and computing path metrics for each survivor path,

selecting the path with larger metrics as a survivor from paths entering a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

selecting the survivor with the largest metric as the best survivor,

determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

4. A method for obtaining a soft decision in detection of a TFM signal, comprising:

sampling a received signal,

reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

rotating a carrier phase,

computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample using two earlier sym-

bols as the original state of the trellis and computing path metrics for each survivor path,

selecting the path with larger metrics as a survivor from pathsentering a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

selecting the survivor with the largest metric as the best survivor,

determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

5. A method according to claim 1, 2, 3 or 4, wherein the rotation of the phase of the signal is carried out by a phase state rotation and a carrier phase rotation.

6. A method according to claim 1, 2, 3 or 4, wherein the phase difference of two consequent symbol instants is

$$\phi(kT+T)-\phi(kT)=(\pi/2)\cdot(\alpha_{k-1}/4+\alpha_k/2+\alpha_{k+1}/4).$$

7. A method according to claim 1, 2, 3 or 4, wherein the signal sample is rotated towards the horizontal axis, i. e. x axis.

8. A method according to claim 1, 2, 3 or 4, wherein the transition metrics and branch metrics are computed by using a Viterbi algorithm or the like.

9. A method according to claim 1, 2, 3 or 4, wherein the weight of the output value is a measure of reliability of the decoded bit.

10. A method according to claim 1, 2, 3 or 4, wherein the modulator is driven into a known state at the end of a frame by supplementing the end of each frame with 12 undecoded tail bits.

11. A method according to claim 1, 2, 3 or 4, wherein the reliability figure is used as feedback information in the demodulator.

12. A method according to claim 1, 2, 3 or 4, wherein the smaller one of the current or previous weights is assigned to the weight of the previous bit.

13. A method according to claim 1, 2, 3 or 4, wherein the sign of the demodulated bit is determined by the best survivor.

14. A method according to claim 1, 2, 3 or 4, wherein feedback information is offered on selecting survivors and calculating phase states to rotate possible transitions determined by the modulation method used.

15. A method according to claim 1, 2, 3 or 4, wherein the computed path metrics are taken into the calculation of weighting as calculation information.

16. A method according to claim 1, 2, 3 or 4, wherein the computed path metrics are passed via a delay line to the calculation of the weight of demodulated bits at a later time instant.

17. A receiver for obtaining a soft decision in detection of a TFM signal comprising:

means for sampling a received signal,

means for reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

means for reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

means for computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample and computing path metrics for each survivor path,

means for selecting the path with larger metrics as a survivor from paths entering a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

means for selecting the survivor with the largest metric as the best survivor,

means for determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

18. A receiver for obtaining a soft decision in detection of a TFM signal comprising:

means for sampling a received signal,

means for reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

means for reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

means for rotating a carrier phase,

means for computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample and computing path metrics for each survivor path,

means for selecting the path with larger metrics as a survivor from paths entering a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

means for selecting the survivor with the largest metric as the best survivor,

means for determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

19. A receiver for obtaining a soft decision in detection of a TFM signal comprising:

means for sampling a received signal,

means for reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

means for reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

means for computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample using two earlier symbols as an original state of the trellis and computing path metrics for each survivor path,

means for selecting the path with larger metrics as a survivor from paths entering a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

means for selecting the survivor with the largest metric as the best survivor,

means for determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

20. A receiver for obtaining a soft decision in detection of a TFM signal comprising:

means for sampling a received signal,

means for reverse rotating the phase of a signal sample in the way that the real part of a complex signal indicates the phase of the sample,

means for reverse rotating the phase changes of possible transitions determined by the modulation method used so that the rotation is opposite to the phase belonging to the old state of a trellis diagram,

means for rotating a carrier phase,

means for computing transition metrics for the state transitions in a trellis diagram with the aid of the real part of the signal sample using two earlier symbols as the original state of the trellis and computing path metrics for each survivor path,

means for selecting the path with larger metrics as a survivor from paths entering a state node, and the phase of that survivor is set as the phase state of the new correlative state in question,

means for selecting the survivor with the largest metric as the best survivor,

means for determining the sign of the demodulated bit with the aid of the last bit of the previous state of the best survivor and calculating the weight of the demodulated bit as the difference of the path metrics of the best survivor and a selected path joining it.

21. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to carry out the rotation of the phase of the signal by a phase state rotation and a carrier phase rotation.

22. A receiver according to claim 17, 18, 19 or 20, wherein the phase difference of two consequent symbol instants is

$$\phi(kT+T)-\phi(kT)=(\pi/2)\cdot(\alpha_{k-1}/4+\alpha_k/2+\alpha_{k+1}/4).$$

23. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to rotate the signal sample towards the horizontal axis, i. e. x axis.

24. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to compute the transition metrics and branch metrics by using a Viterbi algorithm or the like.

25. A receiver according to claim 17, 18, 19 or 20, wherein the weight of the output value is a measure of reliability of the decoded bit.

26. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to drive the modulator into a known state at the end of a frame by supplementing the end of each frame with 12 undecoded tail bits.

27. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to use the reliability figure as feedback information in the demodulator.

28. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to assign the smaller one of the current or previous weights to the weight of the previous bit.

29. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to determine the sign of the demodulated bit by the best survivor.

30. A receiver according to claim17, 18, 19 or 20, wherein the receiver is arranged to offer feedback information on selecting survivors and calculating phase states to rotate possible transitions determined by the modulation method used.

31. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to take the computed path metrics into the calculation of weighting as calculation information.

32. A receiver according to claim 17, 18, 19 or 20, wherein the receiver is arranged to pass the computed path metrics via a delay line to the calculation of the weight of demodulated bits at a later time instant.